October 2019

The Economic Impact of Braidy Industries on Ohio and West Virginia

James V. Koch

This report supplements my previous study which focused on the economic impact of Braidy Industries on Eastern Kentucky and the Commonwealth of Kentucky. In this supplement, I focus on four counties in Ohio and West Virginia immediately adjacent to Boyd County and Ashland, Kentucky. The economic impacts and employment estimates provided here are in addition to those estimated for Eastern Kentucky and the Commonwealth of Kentucky.

The metropolitan area in which Braidy's Ashland development is located spans three states: Kentucky, Ohio and West Virginia. **The region is economically interdependent and thousands of individuals cross state lines and the Ohio River every day to go to work.**

The United States Census estimates that on a daily basis, an average of 3,404 individuals travel from Lawrence, County, Ohio to jobs in Boyd County, Kentucky, while 858 individuals travel from Scioto County, Ohio daily to their jobs in Boyd County. In the case of West Virginia, two counties (Cabell and Wayne) supply nearly all the workers who travel from West Virginia to Boyd County, Kentucky. The Census estimates that 965 workers commute from Cabell County, West Virginia to Boyd County for their work and that 737 workers daily travel from Wayne County in West Virginia to Boyd County for their jobs.

Thus, it should not come as a surprise that a significant proportion of Braidy Industries employees are residents of Ohio and West Virginia and that Braidy's economic activities already are having major impact on those two states. This is what one would expect in a metropolitan area that overlaps portions of three states.

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BACKGROUND

An important reason why the current economic impact of Braidy Industries on the region is so significant is that the area has not fared as well as the rest of the nation in recent decades. In my April report, I outlined these facts for Eastern Kentucky in my previous report and briefly will do the same here for the two adjacent counties in Ohio (Lawrence and Scioto) and the two adjacent counties in West Virginia (Cabell and Wayne). Braidy Industries, however, is changing these numbers.

Table 1 records how these Ohio and West Virginia counties stack up with the rest of the United States in four important categories: population growth, net domestic migration, employment changes and average weekly wages. It is apparent that these counties trail the typical county in the United States with respect to these metrics.

It is precisely here, however, that Braidy will make a difference.

First, its activities and their ripple effects will add jobs. People stay in, or go to, areas that have jobs. I show this in a section below.

Second, Braidy pays above average wages. Figure 1 on the following page reveals that Braidy's average weekly wage is greater than the average wage paid workers in either Ohio or West Virginia, and 17.5 to 35.5 percent above regional county averages in those states.

Table 1

The Performance of Lawrence, Scioto, Cabell and Wayne Counties with Respect to Four Important Socioeconomic Variables 2010

LOCATION	Population Change, 2010-18	Net Domestic Migration, 2010-18	Change in Covered Employment, 2010-18	Average Weekly Wages, May 2018
Ohio				
Lawrence County	-4.13%	-1,781	1.02%	$675
Scioto County	-5.02%	-3,611	0.17%	$738
West Virginia				
Cabell County	-3.19%	-2,885	1.54%	$830
Wayne County	-6.01%	-1,821	-9.69%	$846
U.S. Average	6.0%	N.A.	8.36%	$999

Sources: U.S. Census Quick Facts for population; Bureau of Labor Statistics Quarterly Census of Employment and Wages for employment and the Bureau of Labor Statistics for average weekly wages.

1. James V. Koch, The Economic Impact of Braidy Industries (April 2019, Old Dominion University).
2. These data come from the United States Census, Table 1, Residence County to Workplace County Commuting Flows for the United States and Puerto Rico Sorted by Residence Geography, 5-Year ACS, 2022-2015," www.census.gov

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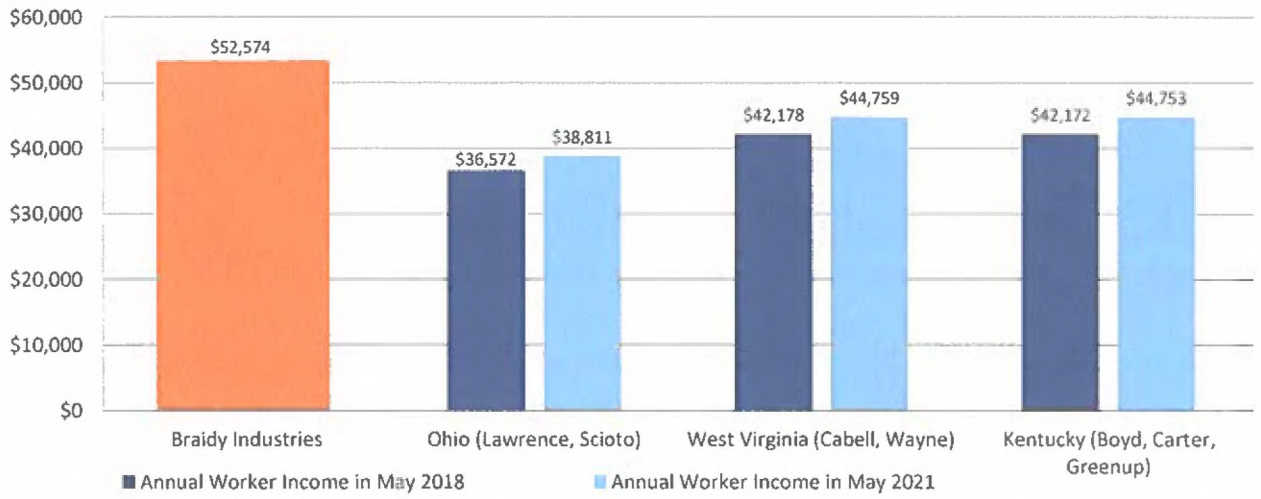
Figure 1

Comparing the Average Annual Wage of Braidy Employees to Selected Counties, Kentucky, Ohio and West Virginia



ECONOMIC IMPACT ANALYSIS RESULTS

Table 2 on the next page summarizes the results of the economic impact study for two counties in Ohio (Lawrence and Scioto) and two counties in West Virginia (Cabell and Wayne).[3] No other counties come close to these counties in terms of their economic connections to Braidy.

The estimates reported in Table 2 include: (1) the effect of Braidy's direct spending; (2) the impact of Braidy's presence upon its suppliers; and, (3) the economic ripple effects that occur when Braidy's employees and suppliers spend money in the region.

If we look only at these four counties, then we can make the following generalizations:

Whether measured by output, earnings, or employment, Braidy's economic impact on West Virginia is larger than its comparable economic impact on Ohio.

Braidy's estimated impact on the value of output in West Virginia is $238.34 million, while the comparable number for Ohio is $152.95 million. Note, however, that while these economic impact numbers include only one year of production, they reflect construction expenditures that are spread over several years.

3. As was the case with the larger study, this supplementary study relied upon the U.S. Department of Commerce's RIMS-II economic impact estimating model to generate estimates. In essence, RIMS-II is an input-output matrix that enables one to see how all parts of the U.S. economy are related to each other. www.bea.gov/resources/methodologies/RIMSII-user-guide

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Braidy's economic impact on West Virginia compared to that on Ohio is proportionately the largest when one looks at the value of output produced because of the places its customers and suppliers are located. West Virginia will enjoy 61 percent of the non-Kentucky economic output impact of Braidy, while Ohio will experience 39 percent.

The picture changes, however, when we look at employment. West Virginia's employment advantage over Ohio is much smaller than its output advantage. This reflects the fact that significant numbers of Braidy employees will be commuting to Ashland from Ohio. Only 52 percent of the non-Kentucky jobs impact of Braidy will occur in West Virginia, while 48 percent will be in Ohio.

The value of Braidy's combined economic impact on output in Ohio and West Virginia is about one-sixth of the size of the value of its economic impact on output in Eastern Kentucky.

Braidy's employment impact in Ohio and West Virginia, however, is about one-third of the size of that for Eastern Kentucky. Once again, this reflects where Braidy workers reside.

Table 2

Summary of the Major Economic Impacts of Braidy Industries in Ohio and West Virginia

	Output	Earnings	Employment
OHIO			
Lawrence County			
Construction	$61,619,266	$78,628,233	1,375
Annual Operation	$26,090,833	$28,626,908	506
Total	**$87,710,099**	**$107,275,141**	1,881
Scioto County			
Construction	$50,102,566	$75,892,099	1,617
Annual Operation	$15,139,600	$21,902,467	447
Total	**$65,242,166**	**$97,794,566**	2,064
Ohio Total			
Construction	$111,721,832	$154,320,332	2,992
Annual Operation	$41,230,433	$50,529,375	953
Total	**$152,952,265**	**$205,069,707**	3,945

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Table 2 (cont.)

	Output	Earnings	Employment
WEST VIRGINIA			
Cabell County			
Construction	$100,008,266	$88,688,432	2,082
Annual Operation	$79,425,260	$37,810,574	842
Total	**$179,433,526**	**$126,499,006**	**2,924**
Wayne County			
Construction	$43,113,800	$49,315,099	1,079
Annual Operation	$15,792,831	$9,491,069	214
Total	**$58,906,631**	**$58,806,168**	**1,293**
West Virginia Total			
Construction	$143,122,066	$138,003,531	3,161
Annual Operation	$95,218,091	$47,301,643	1,056
Total	**$238,340,157**	**$185,305,174**	**4,217**

A CLOSER LOOK AT EMPLOYMENT EFFECTS

Table 3 on the next page focuses more intently upon the employment effects of Braidy's operations. These numbers are stated in terms of "job years," where one job year is one person working for one year. In the case of annual operations, this is a one-year estimate. Construction, however, is spread over several years and a single person might work two or more job years during that process.

The employment effects of construction are roughly three times as large as those connected to annual operations.

It is clear that Braidy's activities will make a significant employment difference in these four counties. **Almost one in every six jobs in Wayne County, West Virginia will directly or indirectly have owed its existence to Braidy, while in Lawrence County, Ohio, it will be approximately one in every seven jobs. Simply put, Braidy is a big economic deal in these counties, especially during the construction process.**

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Table 3

Additional Job Years Created by Braidy Industries' Activities in Ohio and West Virginia

Location	Construction	Annual Operations	Total Job Years	Percent of Current of Two-County Employment
West Virginia	**3,161**	**1,056**	**4,217**	**7.87%**
Cabell County	2,082	842	2,924	6.23%
Wayne County	1,079	214	1,293	19.45%
Ohio	**2,992**	**953**	**3,945**	**13.28%**
Lawrence County	1,375	506	1,881	17.86%
Scioto County	1,617	447	2,064	10.78%
Two-State Totals	**6,153**	**2,009**	**8,162**	**9.80%**

SUMMARY

Only a cursory look at the demographic and economic trends presented in the first section is needed to realize that the advent of Braidy Industries in Eastern Kentucky likely is the most important positive economic development in the region for the past half-century. Whether the measure is the value of the output Braidy produces (or stimulates), or the earnings of its employees (and the ripple effects of their expenditures), or the number of jobs supported directly or indirectly by Braidy, it is fair to say that Braidy is an extremely important development for the region.

This study allows us to say how much more about how big of a deal Braidy is for neighboring Ohio and West Virginia. Braidy's total job impact on Ohio and West Virginia will be about one-third of the size of its impact on Eastern Kentucky. These are jobs in addition to those already estimated for Eastern Kentucky.

Braidy's economic ripples, then, do not stop at the Ohio River or at state borders. Even though Ohio and West Virginia have not directly contributed to Braidy's development, they nonetheless are reaping significant slices of the benefits.

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April 2019

The Economic Impact Of Braidy Industries

Executive Summary

James V. Koch

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Dr. Koch is the author of twelve books and 120 refereed journal articles in addition to op-ed pieces that have appeared in outlets such as the New York Times, the Wall Street Journal and the Washington Post. He has a forthcoming book, The Impoverishment of the American Student, which will be published by the Brookings Foundation. His current research focuses on regional economics topics, including a forthcoming article in the Journal of Economic Analysis and Policy that analyzes the impact of tolls on vehicle traffic. Currently, he is analyzing the whether economics of scale exist in the provision of public services and is conducting a separate study that examines the investment practices of the Virginia Retirement System.

Dr. Koch has completed almost fifty economic impact studies. His complete Curriculum Vitae may be found at www.jamesvkoch.com.

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THE ECONOMIC IMPACT OF BRAIDY INDUSTRIES

JAMES V. KOCH

APRIL 2019

EXECUTIVE SUMMARY

Braidy Industries' decision to build a $1.6 billion aluminum rolling facility in Ashland, Kentucky is an economic development coup of major significance for the Commonwealth of Kentucky. It is an especially gratifying outcome for the Eastern Kentucky region, which has been challenged in recent years by stagnant economic growth and higher than normal rates of unemployment.

Governor Matt Bevin, along with the Kentucky Senate and House of Representatives, and several divisions within the Commonwealth's government including ThinkKentucky, plus the key efforts of the Ashland Alliance, a variety of public-spirited businesses, and a host of elected officials and city leaders, made decisive, timely decisions in order to bring this development to reality. This committed team outcompeted and outhustled other states in order to capture an enterprise whose total economic impact from construction and first year production (2021) will be an estimated $2.80 billion for Kentucky as a whole and $1.54 billion within the adjacent six-county Eastern Kentucky region. Braidy's impact will be felt beyond Kentucky, leveraging its unique location within 250 miles of 13 auto OEMs and accessing the world's leading technology and science hub in Cambridge, MA through its MIT-backed subsidiary, Veloxint. Veloxint's MIT-developed nanocrystalline alloy technology enables metals that are several times stronger, lighter, and more durable.

This economic impact study utilizes the U.S. Department of Commerce's well-known RIMS-II economic impact model. In essence, RIMS-II shows how economic actions are interconnected --- how expenditures made by Braidy to construct its Atlas mill already are rippling through the regional and state economies and affecting everyone from steel producers and concrete suppliers to automobile dealers and pizza restaurants.

RIMS-II, however, also reveals how increased Braidy's economic activity generates additional employee earnings ($371.6 million in Eastern Kentucky and $793.7 million in the Commonwealth) and jobs (about 12,000 additional job years in Eastern Kentucky and 31,000 incremental job years in the Commonwealth).

These activities result in additional tax payments to state and local governments: $35.3 million in Eastern Kentucky and $75.4 million in Kentucky as a whole.

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THE ECONOMIC IMPACT OF BRAIDY INDUSTRIES

Braidy Industries can only be described as an impressive, precedent-shattering economic phenomenon. The company's transformational $1.6 billion, nearly 2 million square feet Atlas aluminum rolling mill project near Ashland, Kentucky is generating an upsurge of welcome economic activity in Boyd and Greenup County, the Commonwealth of Kentucky, and the tristate region consisting of Kentucky, Ohio and West Virginia.

Progress has been rapid. Just after its founding in August 2016, Braidy announced its plan to develop the Ashland site in April 2017. In June 2018, less than a year later, Braidy broke ground on its aluminum rolling mill in the EastPark Industrial Center. This mill is the first Greenfield integrated aluminum rolling mill built in the United States in 35 years. Greenfield construction allows for a healthy balance sheet, near-zero maintenance and environmental remediation costs, lower labor costs, and higher production efficiency for all products. The Braidy Atlas mill is the first mill with a design optimized for automotive-grade production. Planning and construction for the plant is expected to generate in excess of 14,000 job years of employment.

In the interim, Braidy acquired Veloxint,[1] a MIT-incubated firm whose nanocrystalline metal alloys dramatically increase product strength while reducing weight, and NanoAL,[2] a Northwestern University-incubated firm that is a world leader in cost-effective super alloy processes that increase the strength performance of sheet aluminum. The two synergistic acquisitions place Braidy in the enviable position of becoming the newest, most competitive and greenest aluminum sheet producer in not only in North America but also in the world.

There are three major sources of Braidy's competitive advantages. First, Braidy will offset traditionally high costs of production and operation by harnessing the advantages of Greenfield construction and technological advancements of state-of-the-art manufacturing equipment, Further, Braidy's on and off-site propriety technology will lend itself to the future production of high-quality, non-commodity durable and lightweight aluminum sheet efficiently and affordably for its customers.

A second set of advantages focuses on Braidy's central physical location. Eastern Kentucky and Ashland propitiously are located in the nation's epicenter of automotive manufacturing, with 13 automotive OEMs based within 250 miles of Braidy's headquarters. Further, the Atlas mill will have immediate CSX railroad access, while I-64 is only a stone's throw away. When needed, Braidy will also be able to send and receive product via the Ohio River.

Third, Braidy has access to a unique and robust skilled labor pool in the region, one that already contains many individuals who possess the technical training and experience to contribute immediately. An August 2016 study of the region's workforce – EKY Works by Boyette Advisors – concluded that economic changes in the region have created a reservoir of experienced, compatible skilled labor nearby. Braidy should have little problem fulfilling its workforce needs with highly qualified individuals who will propel the momentum and reach of Braidy's impact.

Production at the Atlas mill will not begin until 2021, but 11,000 individuals have already applied for jobs with Braidy. Ashland Community and Technical College (ACTC) currently has over 110 highly motivated students enrolled in a distinctive Associate Degree program co-designed by the Commonwealth, ACTC, and Braidy that will train students across a range of integrated technology specialties and establish a reliable personnel pipeline to fill Braidy's skilled worker positions at its Atlas plant. The inaugural class is scheduled to graduate in 2020. Those who graduate from ACTC's two-year program are guaranteed a job with Braidy at an annual wage approximating $60,000 – a highly attractive prospect in an area where counties' per capita income ranged between $29,000 and $37,000 in 2016.[3] Braidy is providing significant opportunities for individuals in the region to improve their lives while allowing them to stay in Eastern Kentucky.

Braidy will produce approximately 300,000 tons of production-ready series 3000, 5000 and 6000 aluminum sheet for transportation sector customers, who covet high quality, corrosion resistant, reduced weight aluminum alloys that are

[1] www.veloxint.com

[2] www.nanoal.com

[3] Federal Reserve Bank of St. Louis, "Per Capita Personal Income in Greenup County, Kentucky," https://fred.stlouisfed.org/series/PCPI21089

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cost-effective and meet changing regulatory and environmental standards. Historically, it has been difficult for American aluminum firms to satisfy this demanding combination of automotive needs. This is one of the reasons why Braidy Atlas mill is the first new aluminum plant to be constructed in the United States in over thirty years. The result is a 30-50 percent cash conversion cost advantage driven by nearly 20 competitive advantage features including: favorable power rates, very low maintenance costs, flexible, high-efficiency.

manufacturing and logistics processes, no. environmental remediation, lowest Selling, General & Administrative Expenses (SG&A) in the industry, and lowest labor costs/ton.

Braidy enters this market at a promising time. With tariffs and anti-dumping duties making foreign aluminum sources less attractive, customers have been motivated to place orders with Braidy at levels that have pre-sold capacity through the plant's first seven years of production.

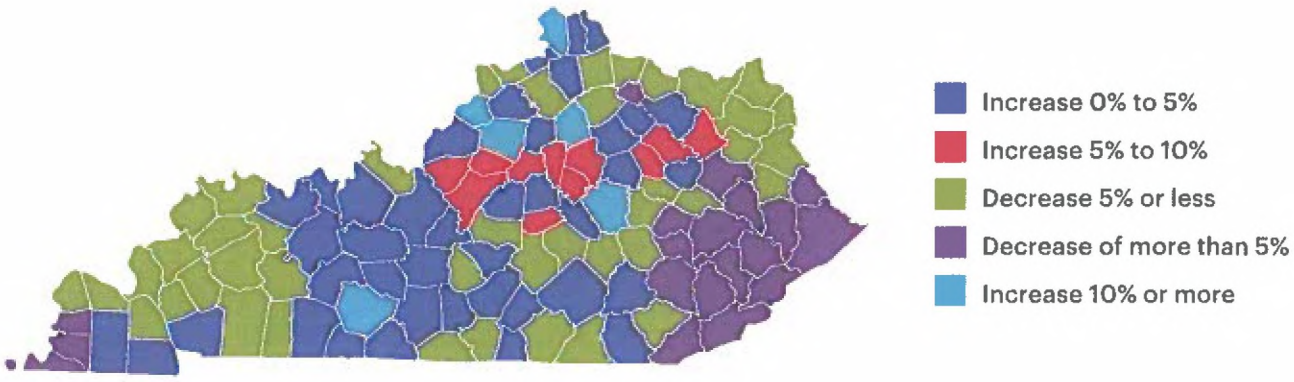
SETTING THE STAGE OF THE REGION

The economic impact of Braidy's aluminum rolling mill project is especially great in the context of Eastern Kentucky's current gross regional product. For comparative purposes, if Braidy chose to build its $1.6 billion expenditure in a large metropolitan region like Atlanta, it would contribute only .13 percent of the Atlanta region's gross regional product over the 2018-20 construction period, but will represent 3.7 percent of the gross regional product of the Huntington-Ashland metropolitan statistical area – 28 times as large.[4]

In recent years, the Eastern Kentucky region has experienced stagnant or declining population. The population of Ashland has declined 14 percent since 1990, while that of neighboring Huntington is down 16 percent over the same period. [5]

Figure 1

Percent Population Change by County in the Commonwealth of Kentucky, 2010 to 2017



Source: United States Census Bureau, 2017 Population Estimates and 2010 Decennial Census, www.census.gov/data/datasets/2017/demo/popest.html.

[4] Federal Reserve Bank of St. Louis, https://fred.stlouisfred.org.

[5] U.S. Census Bureau, www.census.gov

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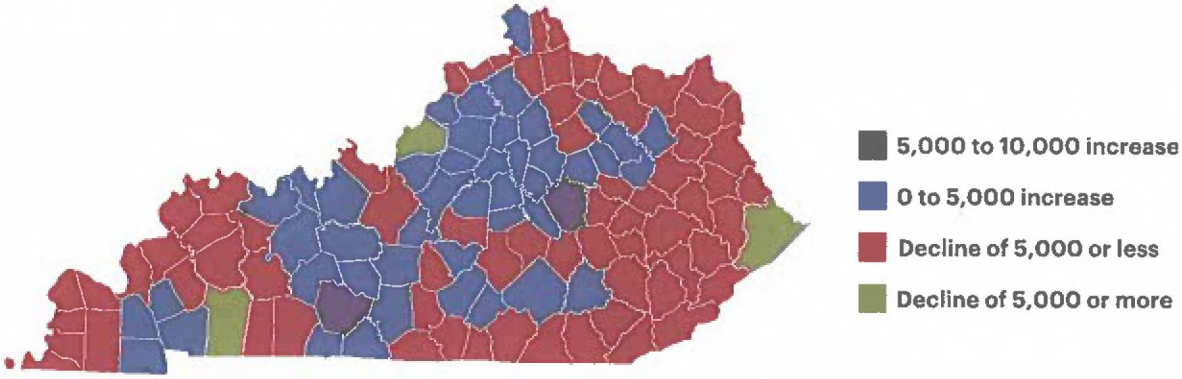
Net domestic migration is a measure that captures the magnetic effect that jobs have upon where people choose to live. It quantifies the number of individuals who migrate between areas inside the United States. Figure 2 reports that net domestic migration typically has been negative, meaning more people are leaving than coming, in every county in Eastern Kentucky over the past decade. However, the job growth and economic revitalization Braidy is projected to bring to region will not only incentivize those already living in the area to stay but be a catalyst for positive migration.

Figure 2

Net Domestic Migration by County:
Commonwealth of Kentucky, 2010 to 2017



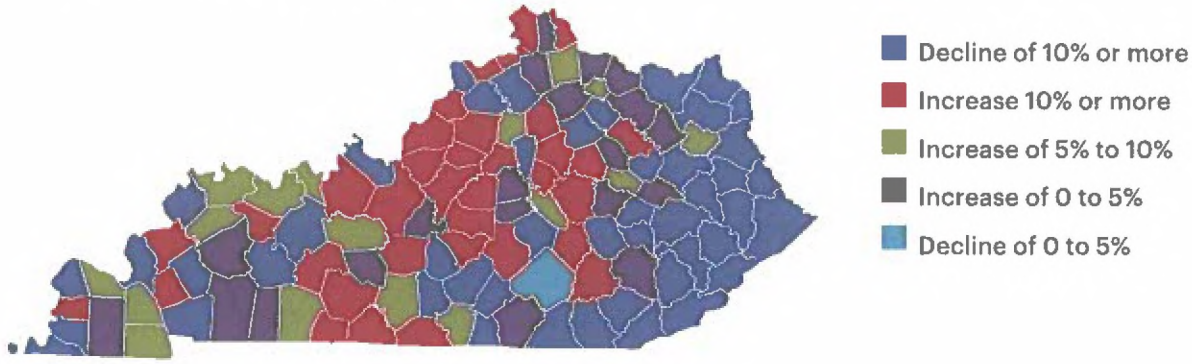
Source: United States Census Bureau, 2017 Population Estimates and 2010 Decennial Census, www.census.gov/data/datasets/2017/demo/popest.html.

Figure 3 illustrates the decline in "covered employment"[6] that has occurred in many counties in Kentucky, but uniformly in Eastern Kentucky between 2010 and 2017. Most counties witnessed declines in employment that exceeded 20,000 over this period. Once again, the Atlas aluminum rolling mill project, contributing an estimated 1,000 construction and 600+ full time jobs to the region, will likely guide this trend in a positive direction.

More than 95 percent of all jobs in the United States are "covered" in the QCEW's "covered employment" estimates.

Figure 3

Changed in Covered Employment in the
Commonwealth of Kentucky, 2010 to 2017



Source: United States Census Bureau, 2017 Population Estimates and 2010 Decennial Census, www.census.gov/data/datasets/2017/demo/popest.html.

[6] More than 95 percent of all jobs in the United States are "covered" in the QCEW's "covered employment" estimates.

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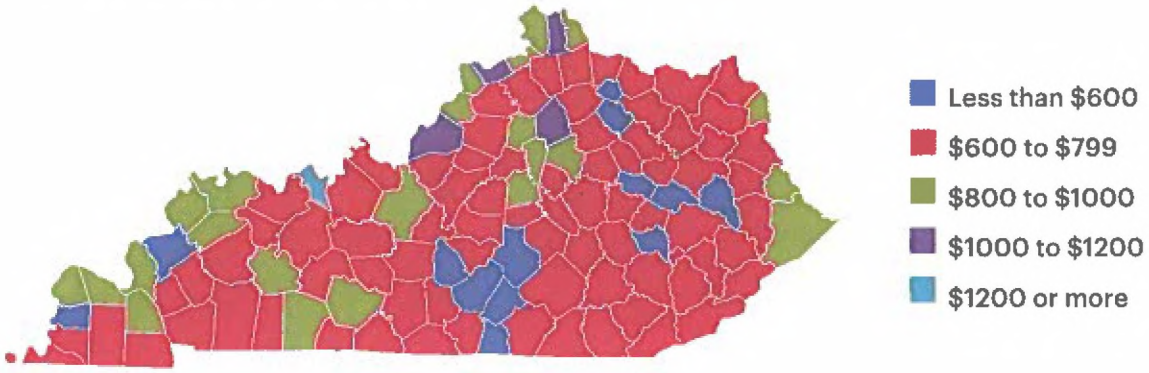
Wage rates constitute another useful barometer of economic conditions. Figure 4 reports average weekly wages for employees in the counties of Kentucky in 2017. When translated to annual incomes and evaluated against Braidy employees' average wages when production begins in 2021, Braidy's role in making Eastern Kentucky a competitive economy becomes immediately clear.

Figure 4

Average Weekly Wages for Covered Employees, Counties in the Commonwealth of Kentucky, 2017



Source: Bureau of Labor Statistics, Quarterly Census of Employment and Wages, 2017, www.bls.gov/cew/data.htm.

Figure 5 reveals that in May 2017, the average annual income of a worker in Kentucky was $42,410, while it was $41,330 in the Ashland-Huntington metropolitan region and $38,100 in Carter County. Let's assume a 2.0 percent annual increase in wages between 2017 and 2010. In Kentucky, for example, this means that its average worker income of $42,410 in 2017 will increase to $45,906 in 2021.

In 2021, Braidy's first year of production, the average annual income earned by its 600+ employees will be $52,574 (see Table 1). Thus, in 2021, the typical income of a Braidy worker will be 31.1 percent higher than the median income of a worker in Boyd, Carter and Greenup counties, and 28.3 percent higher than the median income of a Kentuckian.

Federal Reserve Bank of St. Louis, https://fred.stlouisfred.org.
U.S. Census Bureau, www.census.gov

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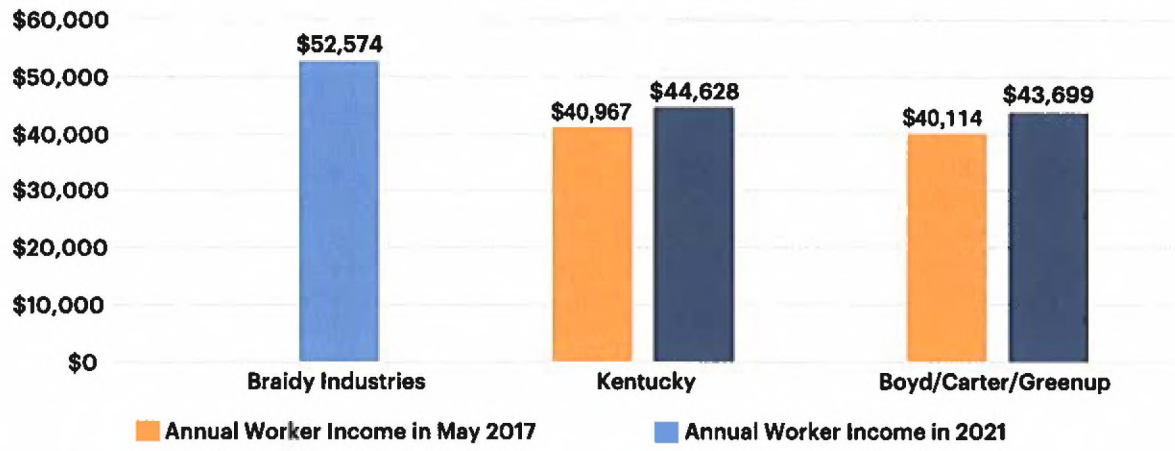
Figure 5

Comparing Average Employee Incomes at Braidy to others in the Region: 2017 and Estimated 2021



Source: Bureau of Labor Statistics, "Occupational Employment Statistics," www.bls.gov/oes.

Table 1

Worker Classifications and Estimated Annual Incomes of these Workers at Braidy Industries, 2021

Type of Employment	Number of Workers	Average Annual Braidy Salary
Officials and Managers	10	$100,000
Professional	24	$77,500
Technicians/Team Leaders	26	$65,000
Sales	3	$47,500
Office and Clerical	7	$45,100
Craft and Skilled	40	$55,000
Semi-Skilled Operators	292	$45,000
Laborers	164	$42,500
Service Workers	40	$18,500
	602 Total	**$52,574 Average**

THE RIMS-II ECONOMIC IMPACT MODEL

All economic impact estimates reported in the next section were generated by the U.S. Department of Commerce's well-regarded and frequently used RIMS-II economic impact model. RIMS-II is a local and regional input-output estimating tool that assumes that every part of a local or regional economy is interrelated. Thus, RIMS-II assumes that any expenditure made by consumers, business firms, non-profit organizations, or governments has an economic impact, creating a wave that ripples throughout the economy. RIMS-II measures the total economic impact of that wave until it disappears. The U.S. Department of Commerce has developed a set of "multipliers" that show how various parts of local and regional economies are interconnected. These multipliers measure the ultimate size of the economic wave.

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In the event that the Social Security Administration increases the Cost-of-Living Adjustment (COLA) then RIMS-II multipliers, based upon past behavior, will predict how and where the additional dollars associated with the cost-of-living increase will be spent. Further, nearly always there are economic ripples associated with an expenditure. Dollars spent usually are re-spent and hence an economic wave is created that flows throughout the economy. Benefitting from this economic wave will be car dealers, pizza parlors, colleges, grocery stores, homebuilders, churches, and governments as taxes are paid.

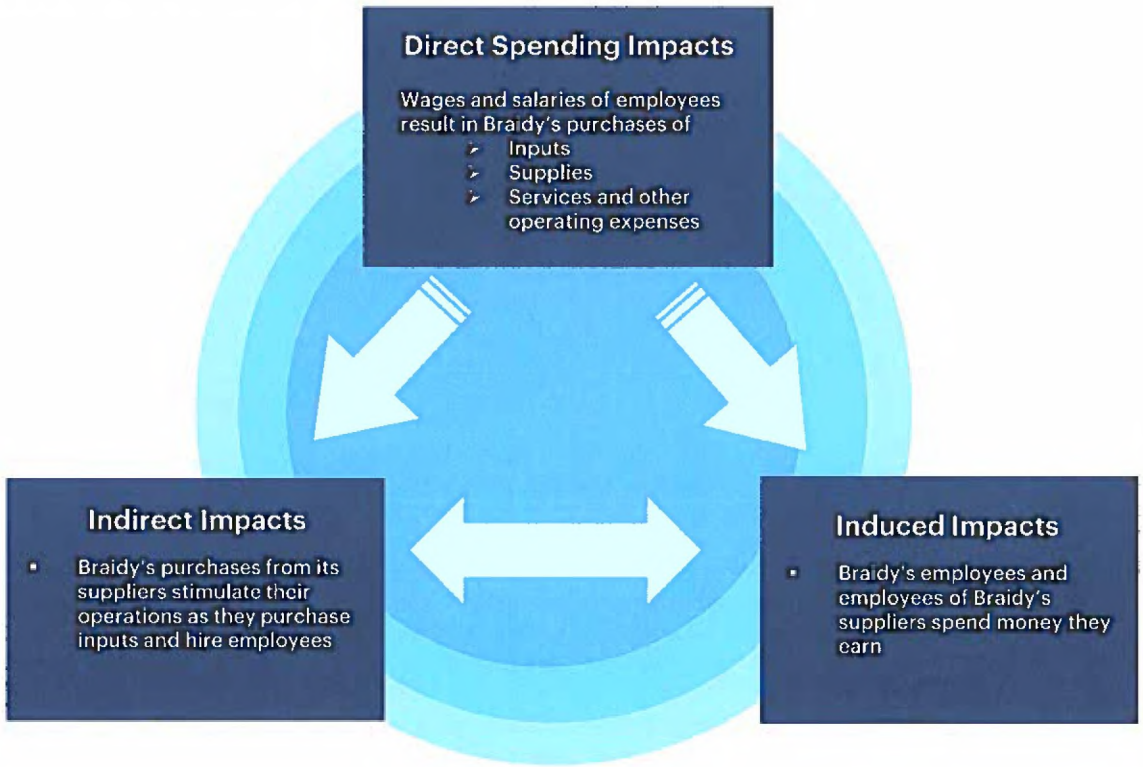
The employees of these groups benefit as well. Businesses ranging from Wal-Mart and Costco to restaurants and cable television providers will need to attract and retain employees to service the increased demand for their services. Service providers such as attorneys, hair stylists and athletic teams experience the same surge. RIMS-II measures the size of these reactions and estimates the number of additional jobs created by the economic ripples.

The size and impact of any economic wave eventually disappears unless local spending remains consistent. Alternatively, when individuals save money or spend their money in distant economies the size of the local or regional spending multipliers become smaller and the ultimate economic impact of any wave is reduced. Based upon extensive analyses of expenditure patterns, RIMS-II estimates take these circumstances into account.

Figure 6 depicts the estimating process that RIMS-II utilizes. Note three different kinds of economic impacts: *direct, indirect* and *induced*. *Direct economic impact* reflects the immediate economic influence of an expenditure upon incomes and jobs. For example, if a Shell gasoline station receives more business, then it may have to hire more employees and spend more dollars on its own operations.

Figure 6

Rims-ii Measures The Size Of Economic Ripple Effects



3 Federal Reserve Bank of St. Louis, "Per Capita Personal Income in Greenup County, Kentucky."
4 https://fred.stlouisfed.org/series/PCPI21089

Indirect economic impact reflects purchases that must be made by the businesses whose patronage has increased because of the injection of funds. If more money is spent at the Ford dealer, then the Ford dealer must hire more workers and purchase more supplies to meet this demand.

The employees hired by suppliers earn wages and when they spend their income this generates *induced economic impact.*

The arrows in Figure 6 reflect economic leakages. They reflect the act of saving and non-local purchases, both of which reduce the sizes of the local, regional and state economic multipliers.

The RIMS-II model takes each of these factors into account and provides a net estimate of the total economic impact of an action; direct economic impact + indirect economic impact + induced economic impact = total economic impact. From this, the RIMS-II model deduces the number of additional jobs created as a result of increased demand for a product or service, for example, Braidy purchasing electricity locally to run its operation. Moreover, taking this one step further, we can estimate the additional tax receipts that governments will receive because of the increased economic activity. The usual source for these estimates is the Tax Foundation.[7]

THE ECONOMIC IMPACT OF BRAIDY INDUSTRIES

Table 2 summarizes Braidy's cumulative economic impact upon Eastern Kentucky and the Commonwealth of Kentucky through 2021, assuming that 2021 represents the first full-year of production. The following three phases, which are largely fluid, will contribute to Braidy's cumulative economic impact: (1) planning, (2) construction and, (3) production.

Braidy's planning phase includes programs related both directly and indirectly to the future success and regional impact of the Atlas mill. Local and regional economic development authorities like the Ashland Alliance, The Commonwealth of Kentucky, especially the Cabinet for Economic Development, and prospective partners and suppliers collaborated with Braidy's leadership during this phase. With a wide range of partners, Braidy developed proposals, researched possibilities, worked with legislators and elected officials and negotiated with a variety of suppliers like local electric utility powerhouse Kentucky Power to maximize the mill's impact. With its long-term vision in mind, Braidy, with its partners, laid the groundwork to train Braidy's talent pool, forming the Advanced Integrated Technology Associate's Degree program at Ashland Community and Technical College (ACTC). While Braidy has achieved many milestones in the planning phase to date, planning will continue through the construction and operation phases as Braidy recruits and secures investors for initial and long-term financing.

While planning activities continue, Braidy is heavily engaged in construction work, compaction and foundational work as well as detailed engineering to rapidly build the infrastructure for full-scale production. A significant portion of Braidy's economic impact is associated with the construction of the $1.6 billion Atlas mill and supporting infrastructure.

[7] https://taxfoundation.org/state/kentucky.

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Table 2

Economic Impact (Direct, Indirect, Induced) Of Braidy On Eastern Kentucky And The Commonwealth Of Kentucky

Eastern Kentucky				Commonwealth of Kentucky			
		Output				Output	
	Final Demand	Multiplier	Impact on Total Output		Final Demand	Multiplier	Impact on Total Output
Planning and Construction	$731,669,346	1.4807	$1,083,382,801	Planning and Construction	$975,559,128	2.0931	$2,041,942,811
Operations Single Year	$314,335,800	1.4414	$453,083,622	Operations Single Year	$349,262,000	2.1782	$760,762,488
Totals	$1,046,005,146		$1,536,466,423	Totals	$1,324,821,129		$2,802,705,299
		Earnings				Earnings	
	Final Demand	Multiplier	Impact on Earnings		Final Demand	Multiplier	Impact on Earnings
Planning and Construction	$731,669,346	0.3842	$281,107,363	Planning and Construction	$975,559,128	0.6416	$625,918,737
Operations Single Year	$314,335,800	0.2880	$90,528,710	Operations Single Year	$349,262,000	0.4803	$167,750,,539
Totals	$1,046,005,146		$371,636,073	Totals	$1,324,821,128		$793,669,275
		Employment				Employment	
	Final Demand	Multiplier	Impact on Employment		Final Demand	Multiplier	Impact on Employment
Planning and Construction	$731,669,346	8.6353	6,318	Planning and Construction	$975,559,128	14.7250	14,365
Operations Single Year	$314,335,800	6.1359	1,929	Operations Single Year	$500,000,000	10.4798	3,660
Totals	$1,046,005,146		8,247	Totals	$1,481,250,000		18,025
		Value Added				Value Added	
	Final Demand	Multiplier	Impact on Value Added		Final Demand	Multiplier	Impact on Valued Added
Planning and Construction	$731,669,346	0.7923	$579,701,623	Planning and Construction	$975,559,128	1.1000	$1,073,115,041
Operations Single Year	$314,335,800	0.6120	$192,373,510	Operations Single Year	$349,262,000	0.9416	$328,865,099
Totals	$1,046,005,246		$772,075,132	Totals	$1,324,821,128		$1,401,980,140

(1) Eastern Kentucky is defined narrowly as a six-county region including the counties of Boyd, Carter, Elliot, Greenup, Lawrence and Lewis.

(2) Incremental state and local government tax collections estimated to be $35.48 million in Eastern Kentucky and $82.62 million in the Commonwealth of Kentucky.

(3) Kentucky's average state and local tax rate as a percentage of personal income is 9.5% according to the Tax Foundation, https://taxfoundation.org/state-and-local-tax-burdens-historic-data. The assumption is that Kentucky's 6.0% sales tax rate and its 5.0% flat rate income tax will continue at least through the end of 2021.

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In 2021, the nearly 2 million square foot, fully integrated aluminum rolling mill in the EastPark Industrial Center will begin to produce aluminum, primarily in the form of Series 3000, 5000 and 6000 aluminum sheet products. The results presented here assume full-scale production in 2021.

The economic impact data reported in Table 2 reveal four important relationships.

- The overall economic impact of planning and construction of the major facility on the Commonwealth of Kentucky will be almost 2.6 times larger than the annual economic impact generated by annual production when output begins in 2021.
- The Commonwealth of Kentucky, outside of the six-county Eastern Kentucky region, will receive in excess of 70 percent of the economic impact associated with Braidy's planning and construction activities.
- Ongoing production anticipated by Braidy in 2021 will generate an economic impact of $453.1 million, employee earnings of $90.5 million, and 1,929 additional jobs in the six-county Eastern Kentucky region.
- Braidy's 2021 anticipated production will result in $760.8 million in economic impact, $173.8 million in employee earnings, and 3,600 additional jobs in the Commonwealth of Kentucky overall.

Braidy's Impact on Output Value

Businesses produce outputs, which are conventionally valued by the prices at which they sell. Our estimates through 2021 of Braidy's impact on the value of output are $1.536 billion in Eastern Kentucky and $2.803 billion in Kentucky overall. To place these numbers in context, we estimate that Eastern Kentucky's $1.536 billion economic impact for Eastern Kentucky will be slightly more than one-third (34.5 percent) of the value of its entire 2017 economic output. This will supercharge the economies of the six-county Eastern Kentucky region. For the Commonwealth, the impact is smaller (1.39 percent of the value of its 2017 annual output), but still highly significant.[8]

Braidy's Impact on Earnings

Through 2021, we estimate a $371.64 million impact of Braidy on earnings in the six-county Eastern Kentucky region and a $736.67 million impact of Braidy on earnings in Kentucky. For context, total personal income reported by residents of the six-county region was $4.98 billion in 2017. Braidy's activities will increase this number by approximately 7.5 percent, albeit over the space of three years. For the Commonwealth, Braidy's activities through 2021 will generate earnings that will be about .4 percent of its total annual earnings in 2017.

[8] Note, however, that Braidy's economic impact is spread over several years, while the value-of-output numbers are for a single year. The source for these numbers if the Federal Reserve Bank of St. Louis's FRED data base.

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Braidy's Impact on Employment

Providing opportunities for individuals to engage in productive, well-compensated employment is central to Braidy's vision. We estimate that Braidy's activities will generate 8,247 additional jobs in the six-county Eastern Kentucky area and 18,025 additional jobs in Kentucky overall over the space of three years. Construction activities will account for approximately three-quarters of these jobs. Braidy's construction activities, however, are occurring over an approximate two-year period. Thus, in job years, Braidy's activities will generate about 12,000 incremental job years in Eastern Kentucky and about 31,000 more job years in the Commonwealth.

Braidy's Tax Payments

Estimating tax payments can be a fraught enterprise because the taxes businesses pay often depend on somewhat subjective assessments of the value of assets, which items and activities are (or are not) in the tax base, a host of possible deductions, exemptions and exclusions, and local administrative preferences and quirks.

Fortunately, the Tax Foundation provides a viable alternative to an otherwise complicated process by providing estimates of total state and local tax effective average tax rates in states. For Kentucky, this percentage is 9.5 percent of state personal income and includes the Commonwealth's 6.0 percent sales tax rate and its 5.0 percent flat rate income tax. The Tax Foundation ranks Kentucky 23rd among the states in terms of its overall business tax climate.[9] The estimated state and local tax payments that will be made by Braidy through 2021 are $35.31 million to government entities in the six-county Eastern Kentucky region and $75.40 million within the Commonwealth overall. Approximately three-quarters of these tax payments will relate to planning and construction activities.

Acknowledgements

So many organizations and individuals contributed to this report that it is impossible to mention all of them. Particularly crucial, however, were Craig T. Bouchard, Braidy's Board Chairman and CEO of the corporation, Blaine Holt, Braidy's Chief Operating Officer Nate Haney, Braidy's Senior Vice President for Government Relations, and Julie Kavanaugh, Braidy's Chief of Staff. Numerous other individuals within Braidy and the Ashland Alliance provided vital inputs at critical junctures.

The Dragas Center for Economic Analysis and Policy in the Strome College of Business at Old Dominion University supplied critical personnel including Vinod Agarwal, Professor of Economics and Director of the University's Economic Forecasting Project, Robert McNab, Professor of Economics and Director of the Dragas Center and Ziniya Zahedi, the Center's Technology Officer.

At the end of the day, errors and omissions remain the responsibility of James V. Koch.

[9] https://files.taxfoundation.org/20180925174436/2019-State-Business-Tax-Climate-Index.pdf.

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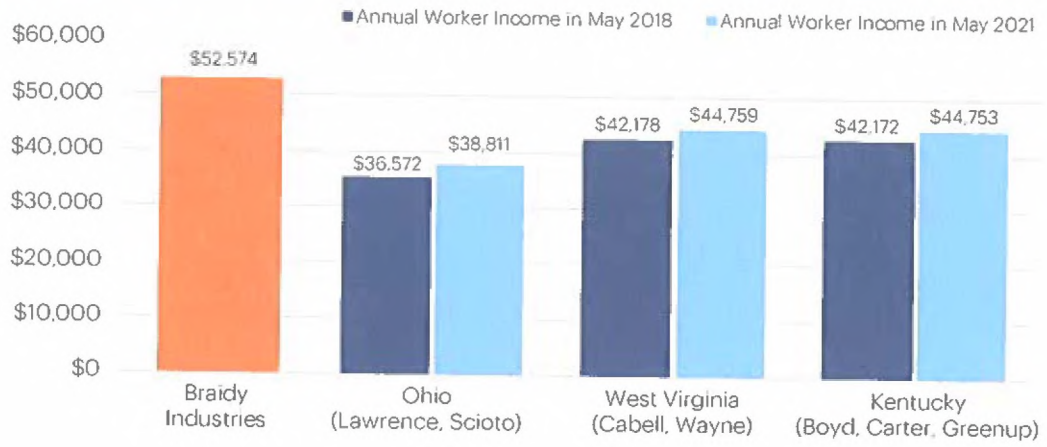
BRAIDY INDUSTRIES

Building Braidy, Rebuilding Appalachia with Technology

The multi-materials, high technology lightweighting company

ANNUAL WAGE OF BRAIDY EMPLOYEES

Compared to Select Counties and States



BRAIDY'S AVERAGE WEEKLY WAGE IS 17.5-35.5%

above regional West Virginia and Ohio county averages.

SUMMARY OF THE MAJOR ECONOMIC IMPACTS OF BRAIDY INDUSTRIES IN OHIO AND WEST VIRGINIA

		OUTPUT	EARNINGS	EMPLOYMENT
OHIO TOTAL	Construction	$111,721,832	$154,320,332	2,992
	Annual Operation	$41,230,433	$50,529,375	953
	Total	$152,952,265	$205,069,707	3,945
W. VIRGINIA TOTAL	Construction	$143,122,066	$138,003,531	3,161
	Annual Operation	$95,218,091	$47,301,643	1,056
	Total	$238,340,157	$185,305,174	4,217

$153.0M

Braidy's estimated impact on the value of output in Ohio.

$238.3M

Braidy's estimated impact on the value of output in West Virginia.

Note that while these economic impact numbers include only one year of production, they reflect construction expenditures that are spread over several years.

ADDITIONAL JOB YEARS CREATED BY BRAIDY INDUSTRIES' ACTIVITIES IN OHIO & WEST VIRGINIA

DISSEMINATED BY MERCURY PUBLIC AFFAIRS, LLC, A REGISTERED FOREIGN AGENT, ON BEHALF OF EN+/ LORD GREGORY BARKER. MORE INFORMATION IS ON FILE WITH THE U.S. DEPARTMENT OF JUSTICE, WASHINGTON, D.C.

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En+ Group Ltd

En+ calls on LME to introduce emissions disclosure rules

Russian metals group urges London Metal Exchange to force producers to disclose carbon footprint

Producing aluminium requires vast amounts of power to transform its key raw material into finished metal © Bloomberg

Neil Hume, Natural Resources Editor SEPTEMBER 22 2019

En+, the hydropower and metals group formerly controlled by Russian oligarch Oleg Deripaska, has called on the London Metal Exchange to join the fight against global warming by introducing new disclosure rules on emissions.

Greg Barker, the group's executive chairman, said the world's largest market for industrial metals should force aluminium producers that use the exchange to reveal the carbon footprint of their metal.

"As a first step to meaningful carbon reduction, every company needs to be far more transparent in disclosing the carbon content of the aluminium it produces," Lord Barker, a former UK energy and climate change minister, wrote in the Financial Times on the eve of the UN Climate Summit in New York.

Aluminium has been identified by the UN as one of the seven "hard to abate sectors" where moves to reduce emissions is crucial.

The call from the world's biggest aluminium producer outside of China adds to the pressure the 142-year-old exchange is facing to ensure that the metals traded on it, including zinc and copper, are responsibly sourced.

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The LME earlier this year announced rules requiring all metals on the exchange to be responsibly sourced from 2022. Although they target the likes of child labour, they carry less onerous environmental standards that have been criticised by campaign groups including Amnesty International.

Lord Barker has been touting the environmental credentials of En+ since the company, which controls Rusal, was freed from crippling US sanctions at the start of the year after Mr Deripaska relinquished control of the company.

It signed a deal in April to supply the largest new aluminium plant built in the US in nearly four decades with low-carbon aluminium. The company is also working on new smelter technology that it says will create a completely emissions-free version of the metal. It has also put its coal-fired power stations in Russia up for sale.

While producing aluminium is energy-intensive given the vast amounts of power required to transform its key raw material, alumina, into finished metal, Rusal claims its products are low carbon because most of its smelters are hydro powered.

LME said it had been engaging with industry participants over the question of environmental standards on its metals. The exchange recently set up a working group to examine the issue, including low-carbon aluminium and the need for greater transparency.

The LME said: "While we recognise there is not yet a global consensus on environmental sustainability in the aluminium sector, we are engaging with industry participants in bringing together existing initiatives and are committed to providing the necessary support to drive this crucial issue forward."

The push by En+ for carbon disclosure was criticised by rival producers, who said the Russian company was simply trying to carve out a special niche for its metal so it could charge a premium tied to its environmental credentials.

"The sustainability debate is much wider than just carbon emissions," said one of the producers. "It has to take into account human rights and water usage."

The move by En+ underlines how metal and mining companies are facing increasing pressure to prove they can play in a shift to a low-carbon economy. Rusal says aluminium will be a key building block of the low-carbon economy, used in electric vehicles and sustainable packaging.

If the LME forces greater transparency, it will be a "vital first step in the creation of a new asset class here in London — low-carbon aluminium", said Lord Barker.

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Simon Webber, lead portfolio manager at Schroders, said a shift to lower carbon metal would only be helped by greater transparency. "The emission profile of aluminium production is huge and very disparate. It can be produced with four or five tonnes of Co2 or 20 — and more than half the industry does it with 20. We should know that," he said.

Alf Barrios, chief executive of Rio Tinto's aluminium division, which launched its own low-carbon aluminium brand in 2016, said: "We have helped to pioneer responsible production standards through the Aluminium Stewardship Initiative that cover not only carbon emissions but a broad range of sustainability measures along the value chain."

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